

**SUGARY SNACKS CONSUMPTION, CARIES EXPERIENCE AND ORAL
QUALITY OF LIFE AMONG URBAN PRIMARY SCHOOL PUPILS IN TANGA**

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**SUGARY SNACKS CONSUMPTION, CARIES EXPERIENCE AND ORAL
QUALITY OF LIFE AMONG URBAN PRIMARY SCHOOL PUPILS IN TANGA**

By

Rajab M, Sasi

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Degree of Master of Dentistry (Community Dentistry) of
Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences
November, 2011

Certification

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and allied Sciences a dissertation entitled "**Sugary snacks consumption, caries experience and oral quality of life among urban primary school pupils in Tanga**" in fulfillment of the requirements for the degree of Master of Dentistry (Community Dentistry) of Muhimbili University of Health and Allied Sciences.

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Declaration and copyright

I, **Rajab M Sasi**, declare that this **dissertation** entitled “**Sugary snacks consumption, caries experience and oral quality of life among urban primary school pupils in Tanga**” is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

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Abstract

Background Snacking is the consumption of foods or drinks in between main meals. People snack when they are not hungry enough for a full meal or want to curb their hunger while they wait for a larger meal later on. People also snack as a form of entertainment even when they are not really hungry or snack because they skipped main meals for various reasons. Naturally people like to eat high fat, high salt and high-sugar foods. This is why snacks manufacturers have been producing snacks that are laden with fats, salt and sugars, excess of which is associated with the occurrence of dental caries and other diet related conditions.

Objectives To determine caries experience and oral health related quality of life and factors associated with consumption of sugary snacks among urban school pupils in Tanga

Methodology This cross-sectional study involved 584 (response rate: 96.3%) pupils aged between 10 years and 16years in four urban primary schools in Tanga. Data was collected between Augsuts to September 2010. Data ware entered and analyzed using computer program SPSS version 13.0. Frequency distributions were done followed by; bivariate associations using chi-square and T- test to compare proportions and means respectively. Multivariate analysis was done by using multiple logistic regressions with OIDP as the outcome variable and independent variables included sugar moments, oral ulcers, teeth sensitivity, and demographic variables.

Results The mean score for sugar moments was 1.93 with no differences by age or sex or caries experience. The most frequently consumed snack was fried cassava. Participants snacked mainly as a result of hunger and thirst. Eighty eight percent took tea or porridge while 58.6% eat fried cassava as a result of hunger. While 54.2% took juice due to thirst. About 28% of the participants had at least one oral impact on daily performance (OIDP). The prevalence of dental caries was 22.3% and the mean DMFT was 0.37; with no age or sex differences in caries experience. Multiple logistic regression revealed that the OIDP was significantly associated with toothache (OR: 1.91; CI: 1.53-2.37), teeth sensitivity (OR: 1.99; CI: 1.56-2.55) and oral ulcers (OR: 1.82; CI: 1.44-2.37).

Conclusion Sugary snacks consumption was low; the commonly consumed snacks were fried cassava and sugared juice with hunger being the major reason for snacking. The snacks were consumed because they were available within the school premises. The prevalence of Caries and oral impacts on daily performance were also low. Toothache, teeth sensitivity and oral ulcer predicted oral impacts on daily performance. Nevertheless there was no correlation between sugar moments and caries experience

Recommendations Although sugary snacks consumption, caries experience and prevalence of oral impact on daily performance were low, school oral health education program should emphasize restriction of selling sugary snacks and encourage provision of school lunch to maintain the disease at low level.

Further researches are needed to study the current relationship between sugar moments and caries experience incorporating other factors which may have influence in the formation of dental caries in Tanzania.

Table of contents

Certification	ii
Declaration and copyright.....	iii
Abstract	iv
Table of contents.....	vi
Acronyms	viii
List of tables.....	ix
List of figures	x
Acknowledgements.....	xi
1. Introduction.....	1
1.1 Background	1
1.2 Literature review	5
1.2.1 Magnitude of snacking.....	5
1.2.2 Reasons for snacking and snack selection	6
1.2.3 Oral quality of life.....	7
1.2.4 Caries experience	8
2. Problem statement.....	9
3. Rationale of the study	10
4. Objectives	11
4.1 Broad Objective	11
4.2 Specific Objectives;	11
5. Methodology	12
5.1 Study design.....	12
5.2 Area of study	12
5.3 Study population and participants.....	12
5.4 Sample size and sampling	12
5.4.1 Sampling methods.....	12
5.4.2 Selection and inclusion criteria for study participants	13
5.5 Data collection and management	13
5.6 Ethical issues.....	14
5.7 Informed consent	14
5.8 Research personnel	14
5.9 Expected outcome	14
6. Results	15
7. Discussion	29
7.1 Magnitude of snacking.....	30
7.2 Commonly consumed snacks.....	31
7.3 Reasons for snacking and snacks selection.....	32
7.4 Oral quality of life.....	33
7.5 Caries experience	35
8. Conclusions.....	37
9. Recommendations.....	38
10. References;.....	38

11. Appendices.....	45
11.1 Consent form (English version)	45
11.2 Consent form (Kiswahili version).....	47
11.3 Questionnaire (English version)	50
11.4 Questionnaire (Kiswahili version)	58

Acronyms

OIDP	Oral Impact on Daily Performance
WHO	World health organization
MUHAS	Muhimbili University of Health and Allied Sciences
MDENT	Master of Dentistry
SPSS	Statistical Package for Social Sciences
DMFT	Decayed, Missing and Filled Teeth

List of tables

Table 1	Distribution of participants by sugar moments
Table 2	Distribution of participant's sugar moments by age and sex
Table 3	Distribution of participants by snack consumption
Table 4	Distribution of participants by food intake
Table 5	Distribution of participants by food selection
Table 6	Distribution of participants by common oral problems
Table 7	Distribution of participants by oral impacts
Table 8	Distribution of participants with oral impact and without oral Impact by DMFT, sugar moments, sex and age
Table 9	Distribution of participants with and without oral impact by Toothache, teeth sensitivity, exfoliation and bad mouth smell
Table 10	Logistic regression of OIDP by age, sex, toothache, sensitivity, Bad smell, oral ulcer and sugar moment
Table 11	Distribution of participants by DMFT
Table 12	Distribution of participant's DMFT by age, sex and sugar moment.

List of figures

Figure 1 Distribution of participants by sugar moments

Figure 2 Distribution of participants by DMFT

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1. Introduction.

1.1 Background

Snacking

A snack is a light meal or an item of food eaten between main meals. Main meal is food that is prepared and eaten, usually at a specific time, by the whole family. In many societies there are three main meals: breakfast taken in the morning; lunch taken during mid day; and dinner taken in the evening (Stedman, 2002). Snacking is therefore the consumption of foods or drinks in between main meals.

People snack when they are not hungry enough for a full meal or want to curb their hunger while they wait for a larger meal later on. People also snack as a form of entertainment, even when they are not really hungry or snack because they skipped main meals for various reasons.

Snacking is not just a modern phenomenon; throughout human history people have been creating snack foods specifically designed to be eaten between designated meals (Evans, 2008).

With industrialization, manufacturing and processing industries emerged worldwide, including food industry and in particular snack industry. Industrialization and civilization changed and is still changing the lifestyles to ones which favor more snacking than before. Therefore the demand for snacking is increasing. With the multiplication of convenience stores, packaged snack foods are now a significant business. Snack foods are typically designed to be portable, quick and satisfying. Processed snack foods are designed to be less perishable, more durable, and/or more appealing than prepared foods. They often contain substantial amounts of sweeteners, preservatives, and appealing ingredients such as chocolate, peanuts, and specially designed flavors such as flavored potato chips.

Naturally people like to eat high fat, high salt and high-sugar foods (Evans, 2008). This is why snack manufacturers have been producing snacks that are laden with fats, salt and

sugars. With increased awareness of consumers on high consumption of salt, fat and sugar foods as the risk factor for the occurrence of chronic diseases, more and more consumers are refraining from these foods and the manufacturers therefore are changing accordingly.

Association between sugary foods consumption and dental caries

Sugars are food nutrients which when metabolized they release energy. They are classified into monosaccharide and disaccharides. Examples of sugars are glucose, fructose, galactose, lactose, maltose and sucrose. Different researchers have made a conclusion that of all the sugars, sucrose is the most cariogenic sugar. The cariogenicity of sucrose is due to its ability to release high energy when a bond between fructose and glucose is broken. This energy is used for synthesis of the extra cellular polysaccharide which later becomes source of sugar for the fermenting microorganisms. Once it is fermented by the bacteria it releases organic acids which have a profound effect on the demineralization of the hard tissue of the tooth and formation of dental caries (Leme et al., 2006 and Aires et al., 2008).

It is evident from experimental studies in human, animal studies and longitudinal studies that, frequent consumption of food containing refined sugar especially sucrose is associated with the occurrence of dental caries. The Hope wood House Study reported a high percentage of caries free mouths for children that were assumed to be related to the use of a lacto-vegetarian diet, compared with free living children who had a higher use of sucrose (Harris et al., 1963).

In the Tristan da Cunha report, where an increase in caries was related to evacuation to England between 1961 and 1963 following a volcanic eruption on the island. An increase in dietary consumption of sugars was paralleled by a rapid rise in caries experience (Fisher et al., 1968). In Vipeholm experiment (1947-1949) a group of mental patients in Sweden were used as subjects in a full-scale experiment designed to bring about tooth decay. They were fed copious amounts of candy, and many of them developed dental caries. (Gustaffson et al, 1954)

The effect of stepwise sugar reduction in cola drinks was tested in a programmed animal experiment using Wistar rats. In a parallel study the pH-decrease at different sucrose concentrations was measured in vitro using a plaque model system which involved *S. mutans*. The reduction of sugar contents by 20%, 33% and 42% resulted in a lower acid production by *S. mutans* strain connected with a decrease of the experimentally produced caries. For this reason the sugar restriction in cola drinks is seen as a contribution towards an improvement of dental health (Maiwald et al., 1979). Review studies on the relationship between frequency of sugar intake and dental caries reveal that in human, a link exists between frequent sugar intake and dental caries (Anderson et al., 2008; and Hartles, 1967).

A three-year longitudinal study carried out with a group of children, initially aged 11-15, residing in non-fluoridated rural communities in south-central Michigan showed higher caries experience to those consuming sugary food at an average of 5.25 occasions or more on daily bases (Burt et al., 1988). Likewise higher daily frequency of sugar intake was strongly related to caries experience at nursery school in low income Brazilian 3 year olds. Children having more than 32.6g of sugar daily at nursery were 2.99 times more likely to have high caries increment than those having less than that amount and children with the highest frequency of sugar intake (4-5 times per day) at nursery were 4.7 times more likely to have high caries increment compared to those with the lowest (Rodrigues et al., 2000). In a study by Kalsbeek and Verrrips (1990), 4% of the Dutch children consumed more than 5 sweet snacks per day. These children had more caries than those who consumed less than that amount. Rugg-Gunn et al., (1984) reported an increase in caries of 5 carious tooth surfaces within 2 years in children aged 11–12 years who consumed more than 163 g sugar/day, whereas children who consumed less than half this amount (78 g) still developed 3.2 carious tooth surfaces. Blicks et al., (1985) found a mean DMFT score of 5.9 for 13-years-old children in an area where the children used 167 g total sugars/day, whereas in another part of Sweden, where the children consumed 147 g total sugars/day, the mean DMFT was found to be 11.4. Frequent sugar consumption was reported to be significantly associated with the occurrence of dental caries in 12 years old schoolchildren in Italy (Angelillo et al., 1999). Similar findings

were also reported in a cross-sectional study carried out on a population of Spanish school children aged 5–15 years old showed that frequent consumption of ice cream, cakes and pastry were significantly associated with dental caries (Serra-Majem et al., 1993).

In Tanzania, snacking and sucrose intake were significantly associated with dental caries in 12 year olds and above in urban areas (Mazengo et al., 1996). Knowledge from a recent past however has failed to demonstrate the traditional strong link between sugars and dental caries due to the counter-effect of Fluorides on caries activity.. Nevertheless; Bagramian et al., (2009) sends a strong signal on a pending public health crisis due to an anticipated global increase in dental caries. Much is desired to be done in terms of using combined approaches in caries prevention; which by no means should exclude dietary control measures.

Oral quality of life

Quality of life is defined as the degree to which a person enjoys the important possibilities of his/her life. Possibilities result from the opportunities and limitations each person has in his/her life and reflect the interaction of personal and environmental factors. Oral quality of life therefore is defined as a multidimensional construct that reflects (among other things) people's comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health”

Untreated dental caries might lead to dental pain which in turn results in impacts of affected play and sleep, avoidance of certain types of food and decreased school performance (Gift et al 1992). Children who have poor oral health have been reported to be 12 times more likely to have restricted activity days than those who do not (Gift et al 1992). Numerous methodological and conceptual problems are involved when developing health related quality of life measures for children; as such measures have to take into consideration distinct changes in the growing child (Connolly et al., 1999).

Most of the changes related to growth may affect the child and therefore the oral health related quality of life measures may have to be age specific. Recently, it has been recognized that using appropriate questionnaire techniques, children can give valid and reliable information and thus should be the primary source of information regarding their oral health related quality of life (Jucovic et al., 2002). The Child version of the Oral Impacts on Daily Performance (OIDP) inventory has been found to be a reliable and valid instrument when applied to children (Yusuph et al., 2006). The Kiswahili version of the Child-OIDP has been shown to be applicable for use among schoolchildren in Tanzania (Mtaya et al, 2007). Therefore in this study the Kiswahili version of the Child-OIDP was used.

1.2 Literature review

1.2.1 Magnitude of snacking

Determination of the prevalence of snacking is important because first, the prevalence gives the magnitude of snacking in a given population. This helps planners to decide the need for intervention. Secondly, it will give baseline statistic that may be used later on to compare with the statistic after the intervention to determine the effectiveness of the intervention and thirdly it will add information to the snacking database.

The magnitude of snacking varies widely around the world. The prevalence of snacking among adults has been reported to be 77% in 1978 and 84% in 1995 in the United States (Zizza et al., 2001), In European countries, prevalence of snacking varies from country to country, in Scotland adolescents (aged 15 years) consume on average 2.8 snacks per day (Anderson et al., 1993) and Portuguese youth (aged 5–15 years) consuming 1.5 snacks per day (Marques-Vidal et al., 2006). In Asia and Russia, snacking rates among youth (aged 2–19 years) are more variable. For example, in the Philippines, Russia and China, 86%, 71% and 10% of youth consume at least one snack on a daily basis (Adair et al, 2005).

In Nigeria among 5-year-old children from the higher social class families consume 5.9 sugared snacks daily, as against 1.5 intakes among their lower social class urban

counterparts. The difference in the frequency of intake among those aged 12 years is much less obvious, 4.9 and 4.2 intakes respectively (Olojugba et al, 1985). In Uganda, secondary school students consume 2.6 sugared snacks daily (Okullo et al, 2003).

In Tanzania the studies on snacking report differently making comparison difficult. In 1988, consumption of sugared food more than three times per day was reported by 21% among 7years old and above in urban Ilala district while their rural counterparts reported prevalence of 14% (Nyandindi, 1988). In 1989, 13% of Tanzanian rural children in Dodoma, Singida and Morogoro regions reported to consume sweets or cakes and biscuits at least twice a day (Normark et al., 1989). In 1997, 15% of 12years old and above in rural Ilala district reported to consume three snacks per day while 27.1% of their urban counterparts reported to consume three times per day (Mazengo et al., 1997).

There has been a small but significant increase in soft drink consumption among students in higher learning institutions from 51% to 56% in 1999 and 2001 respectively (Masalu, 2002). In 2009, 7% Tanzanian adults consumed soft drinks very frequently while sweets or chocolate, chewing gums and biscuits or cakes, were consumed by 5.2%, 4.6% and 3% respectively (Masalu et al, 2009). From the retrieved literature, it is clear that there is no recent data on prevalence of snacking among primary school children in Tanzania. Therefore there is a need to determine the prevalence of snacking among primary school children since this is the age where they develop behaviors.

1.2.2 Reasons for snacking and snack selection

To develop oral health promotion strategies for healthier snacking in order to reduce the prevalence of caries and other chronic conditions, it is necessary to determine the reasons that influence snacking and target these in dietary control measures interventions.

A number of factors have been associated with the likelihood to snack in all age groups around the world .In Tanzania, it is reported that snacking of sugared food and drinks is high among females, higher degree students, and students of urban origin (Åstrøm et al., 2001). In different parts of the world snacking habit seems to be largely influenced by the cost of snacks, their good taste and availability, the amount of pocket money and absence of healthy school food policies, (Oogarah-Pratap et al., 2005 and Adair et al.,

2005). Being adolescent, increased number of snack vending machines and sales promotion of snacks also seem to be among the factors that influence snacking (Savige et al., 2007; and Freeman et al., 2002)

However little is known regarding the factors that influence snacking in Tanzania and the available literature does not compare these factors. In addition; information about factors that influence snack choice is lacking therefore it is important to conduct this study.

Determination of attitude towards different kinds of snacks is important because, positive attitude towards different kinds of snacks may influence snacking behavior. Therefore interventions may be achieved by changing people's attitude toward snacks. Attitude change may be achieved by providing education on the detrimental effects of snacks.

It has been reported that, the attitude and diet behavior of the parent are the main influence of the young children snacking behavior (Sun et al., 2006) and it has been demonstrated that frequent consumers of snacks have positive attitude toward snacking than moderate consumers (Mesters et al., 1992). In Britain, attitude towards snacking predicts women's intention to eat sweet snacks (Grogan et al., 1997). In Tanzania higher learning students have favorable attitude to avoid between meal intakes of sugared snacks (Masalu, 2001). However, little is known regarding attitude of adolescents towards using different kinds of snacks in Tanzania.

1.2.3 Oral quality of life

There is a high prevalence (51%) of oral impact on daily performance among young adults in Tanzania (Masalu et al., 2002) and also among 12-21years old whereby 48.2% reported impacts (Mbawalla et al., 2010). However there is a relatively low prevalence (28.6%) of oral impact on daily performance among primary school children in Tanzania (Mtaya et al., 2007). The prevalence of oral impact on daily performance among school children in Sudan was reported to be 54.6% (Nurelhuda et a.,l 2010). Nuca et al., (2005) reported high prevalence (64.9%) of oral impact on daily performance among 12 years old in Romania. Generally oral impacts increase with age due chronicity and cumulative effects of poor oral health on individual's daily performances. Therefore children should be the priority group to be targeted for oral health promotion activities in order to prevent

oral disease and its sequel right from early life. In addition, since oral diseases are linked to lifestyles, it is important to inculcate lifestyles conducive to oral health since early childhood.

1.2.4 Caries experience

Studies show that dental caries experience is still very low among African countries; Caries experience among 12years old in Tanzania is DMFT of 0.4 and a prevalence of 20% (Mosha et al., 2005). A review of studies considering children's self-reported dental pain revealed prevalence rates of 68% in 12-year-old Indians, 42% in 10–14 year-old Ugandans and 21% among 0–18- year-olds in Kenya (Kiwanuka., 2006). Caries experience among 12 years old in Burkina faso and Ghana are of DMFT 0.7 and 0.4 in 1999 respectively (The WHO oral health atlas, 2009). In Some European countries, caries experience is high to moderate. For example in Albania the DMFT among 12 years old in 2005 was 3.1, in Bulgaria it was 4.4 in 2000 and in Belgium it was 1.1 in 2001 (The WHO oral health atlas, 2009). This variation in caries experience is a reflection oral health related behaviors in different communities; including among others sugar consumption, Fluoride use, dental check-ups, tooth brushing and flossing. The dental profession has to remain vigilant to prevent an unnecessary booming up of caries experience which may result due to slowing down caries preventive programs.

The aim of this study is determine caries experience and oral health related quality of life and factors associated with consumption of sugary snacks among urban schoolchildren in Tanga.

2. Problem statement

Snacking behavior has been associated with the occurrence of dental caries. Dental caries is not life threatening but it impacts quality of life and is highly costly to treat and repair (Moynihan et al., 2004). Dietary habits are rapidly changing in some areas of Tanzania, as well as in other developing countries, as availability of Western foods has improved and a more Westernized life-style has permeated into our societies. Such dietary changes are likely to induce alterations in food behavior and nutrient intakes and may change the prevalence of dental caries. In Tanzania, liberalization of trade links with industrialized countries has brought about imports of greater quantities of sugar; also, commercialized sugar products have increasingly gained social importance (Mazengo et al., 1997). However, the factors that influence primary school children to snack are not known. Oral impact on daily performance especially among children is largely associated with caries experience

3. Rationale of the study

This study will provide information on snacking among primary school children and therefore aiding the decision to intervene. Factors influencing snacking will reveal the reinforcers and deterrents of snacking behavior. In addition the study will contribute the knowledge on oral impacts on daily performances and the way this is related to oral disease among primary school children in Tanga municipality where the principal investigator is stationed to work as a tutor at the Tanga Dental School. This information will form a basis for a range of intervention programs that will be led by the Tanga dental team for its catchment population. The information will also be useful for teaching the Dental students.

4. Objectives

4.1 Broad Objective;

To determine caries experience and oral health related quality of life and factors associated with consumption of sugary snacks among urban school pupils in Tanga.

4.2 Specific Objectives;

1. To determine the prevalence and factors influencing snacking of snacking
2. To determine the commonly consumed snacks.
3. To determine factors influencing snack selection.
4. To determine oral health related quality of life by using the OIDP scale
5. To assess caries experience and its association with OIDP

5. Methodology

5.1 Study design

This was a cross sectional analytical study

5.2 Area of study

The study was conducted in four primary schools located in Tanga Township.

5.3 Study population and participants

The study population included adolescents aged 10 to 16 years in the four primary schools in Tanga municipality.

5.4 Sample size and sampling

Sample size calculation

$$n = \frac{z^2 P(1-P)}{e^2}$$

Where n = sample size

P = prevalence of snacking = 27.1%

e = maximum error = 0.05

z = 95% confidence interval = 1.96

$$n = \frac{1.96^2 \times 0.27(1-0.27)}{0.05^2}$$

n= 303

Since this study was a two stage cluster sampling, to adjust for design effect the computed sample size was multiplied by two. Therefore 606 pupils meeting the inclusion criteria were targeted; however only 584 responded. Therefore the response rate was 96.8.

5.4.1 Sampling methods

This was a two stage cluster sampling. Four schools in the municipality and four classes in each school and one stream from standard 4, 5, 6 and 7 were randomly selected while the participants were selected by using a systematic random sampling.

5.4.2 Selection and inclusion criteria for study participants

Inclusion criteria

Pupils aged 10 to 16 years in the four selected primary schools in Tanga municipality.

Exclusion criteria

Mentally unfit pupils were excluded because some would have been unable to make sense of the questionnaire and respond as required.

5.5 Data collection and management

A structured questionnaire was used to collect information on snacking, reasons influencing snacking and snack selection and oral quality of life in terms of OIDP. A 24-hours dietary recall comprised of 12 moments of food intake was used to collect information on snacks consumption. An eating moment was categorized as a sugar moment if the food item taken contained sugar. . Two categories were further generated, those consuming at a frequency of less than 5 times a day and more than five times a day. Cross tabulation of the two groups by sex and age was done. Chi-square was used to check if there is any significant association. To determine the reasons for snacking and snack selection, frequency distribution by reasons for food intake and food selection was done. Frequency distribution was used to find the proportion of individuals who mentioned specific reasons for snacking, a reason with high proportion of respondents was considered to be the most important reason. Then frequency distribution was also done to determine the commonly consumed snacks. To determine oral health related quality of life an abbreviated version of the child OIDP questionnaire was used (appendix 11.3). Frequency distribution to determine common oral problems during the past three months listed by the school children was done.

The total child OIDP score was constructed by adding the 8 performances which were measured on a three-point scale with reference to difficulty in carrying out eight daily life activities namely eating, speaking, cleaning mouth, sleeping, smiling, school work, emotion and social contact. A distribution with scores ranging from 0-24 impacts on daily performance was obtained, from which a cut off-point was made showing the more affected as “affected” and the less affected as “not affected”. Bivariate association of the affected and not affected by DMFT, sugar moments, age, sex, toothache, exfoliation, sensitivity, bad smell and oral ulcer was done. Chi-square test was used to determine

significant differences. Logistic regression with OIDP as a dependent variable and age, sex, toothache, sensitivity, bad smell and oral ulcer as independent variable was done to determine the likelihood of these factors to causing oral impact on daily performance. A WHO survey form for dental caries was used to assess caries status. The DMFT was obtained by adding up scores of decayed, missing and filled teeth, a mean DMFT and proportion of caries free were then determined. Inter and intra examiner variability was not done due to logistical limitations.

5.6 Ethical issues

The research protocol was submitted to the MUHAS Higher Degrees Research and Publications Committee for ethical clearance. Permission to carry out the study at two primary schools in Tanga urban was sought from the office of Tanga regional education officer. Children who were found to have dental problems were advised and referred to the dental school in Tanga for treatment

5.7 Informed consent

The aim of the study as well as potential risks and benefits were clearly explained to all participants so that they are willing to participate. Free informed written consent was given by each participating pupil. A participant had the right and freedom to join or leave the study unconditionally. Participants were further informed that, Information that is gathered from the study would be kept under confidentiality.

5.8 Research personnel

The personnel comprised of the investigator (Dr. R. Sasi), and two research assistants.

5.9 Expected outcome

1. Magnitude of snacking among adolescents in Tanga urban
2. Reasons influencing snacking and snack selection
3. Caries experience
4. Oral health related quality of life

6. Results

A total of 584 pupils participated in this study, with male and female being almost equal in number.

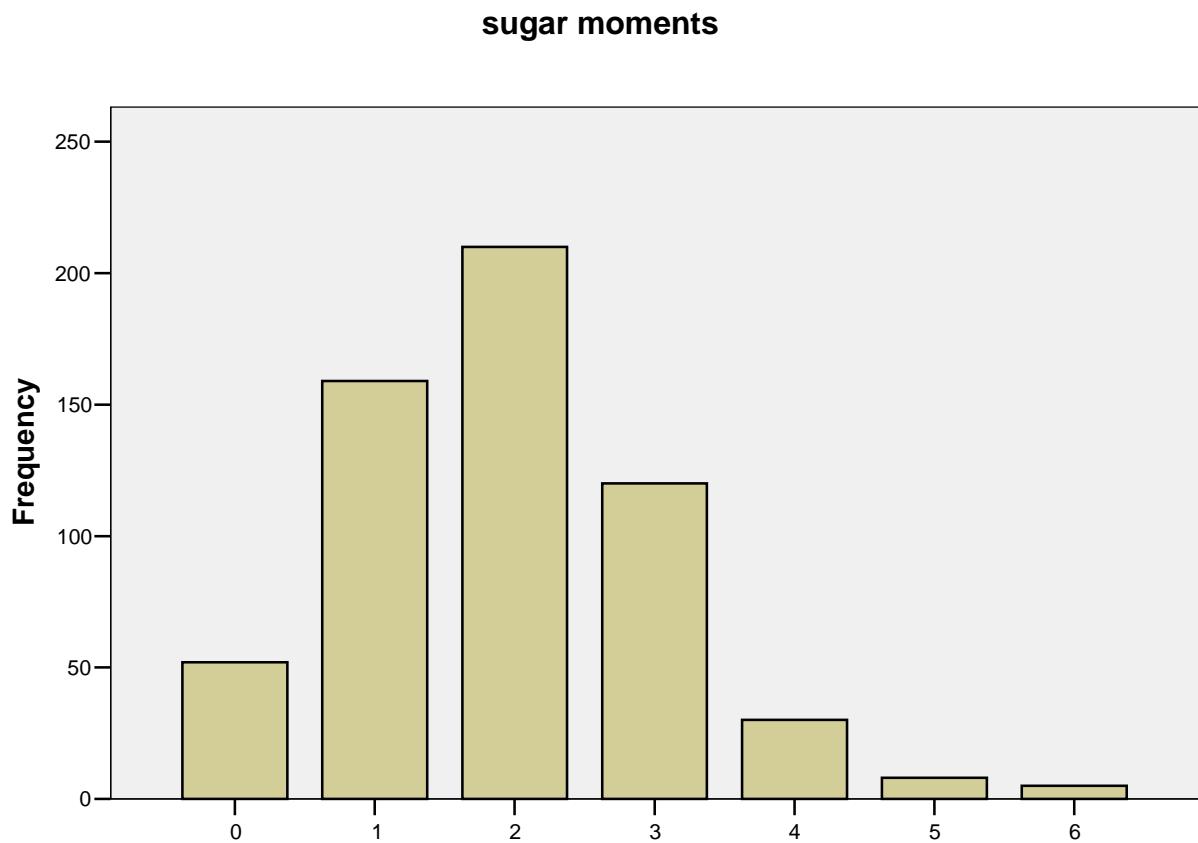
Table 1
Distribution of participants by sugar moments

SUGAR MOMENTS	FREQUENCY (%)
0	52(8.9%)
1	159(27.2%)
2	210(36%)
3	120(20.5%)
4+	43(7.4%)
TOTAL	584(100%)

The mean sugar moments were 1.93 (SD=1.14) times a day.

Figure 1

Distribution of participants by sugar moments



In figure 1, majority of the participants had sugar moments of about 2.

Table 2

Frequency distribution showing the proportion of children's sugar moments by age and sex

	SUGAR MOMENTS		X^2	P VALUE
SEX	< 5 times a day \geq 5 times a day			
Male	284(99.3%)	2(7%)	1.931	0.151
Female	287(98.0%)	6(2%)		
<hr/> AGE				
10-13YRS	487(99.0%)	5(1.0%)	3.209	0.104
14-17YRS	84(96.6%)	3(3.4%)		
TOTAL	571(98.6%)	8(1.4%)		

Table 2 shows that, the proportion of children with sugar moments less than 5 times a day were 98.6% while the proportion of those with sugar moments more than five times a day were 1.4%. However there was no statistical significant difference in sugar moments between sex and age groups ($X^2=1.931$, p-value=0.151 and $x^2=3.209$, p-value=0.104 respectively)

Table 3

Frequency distribution of school children by the type of snacks consumed

TYPE OF SNACK	FREQUENCY
Ice cream, Big G or biscuits	4(0.7%)
Juice	162(27.7%)
Tea or Porridge	101(17.3%)
Ubuyu	39(6.9%)
Andazi or kitumbua	147(25.2%)
Sweet potatoes	54(9.3%)
Fried cassava	227(38.9%)

Table 3 shows that, fried cassava was the most frequently consumed snack (38.9%), followed by juice (27.7%). Ice cream, Big G or biscuits were the least frequently consumed snack (0.7%).

Table 4

Distribution of participants by the reasons for food intake

Reasons	Tea	Juice	Tea &Bread/Andazi	Cassava	Ubuyu	Icecream, big G
Hunger	31(88.6%)	32(22.5%)	304(95.9%)	189(91.3%)	17(58.6%)	0)
Thirsty	0	77(54.2%)	0	6(2.9%)	0	0
Desire	1(2.9%)	27(19.0%)	1(0.3%)	2(1%)	8(27.6%)	3(75%)
Habit	1(2.9%)	0	2(0.6%)	2(1%)	0	0
Friends	0	2(1.4%)	0	1(0.5%)	2(6.9%)	1(15%)
I just like	2(5.7%)	4(2.8%)	10(3.2%)	7(3.4%)	2(6.9%)	0
TOTAL	35(100%)	142(100%)	317(100%)	207(100%)	29(100%)	4(100%)

In Table 4, more children (88.6%) listed hunger as a reason for drinking tea while 54.2% listed thirsty as the reason for drinking juice.

Table 5

Distribution of participants by reasons for food selection

Reasons	SNACKS					
	Tea	Juice	Tea & Bread/Andazi	Cassava	Ubuyu	Ice cre
Available	10(41.7%)	26(20%)	185(58.9%)	80(39.2%)	3(13%)	2(50%)
Curbs hunger	0	2(1.5%)	12(3.8%)	14(6.9%)	1(4.3%)	0
Cheap	1(4.2%)	3(2.3%)	4(1.3%)	9(4.4%)	6(26.1%)	0
Delicious	2(8.3%)	21(16.2%)	9(2.9%)	4(2%)	0	2(50%)
Friends	9(37.5%)	70(53.8%)	94(29.9%)	92(45.1%)	13(56.5%)	0
I just like	2(8.3%)	0	9(2.9%)	4(2%)	0	0
Thirsty	0	8(6.2%)	0	1(0.5%)	0	0
Total	24(100%)	130(100%)	303(100%)	204(100%)	23(100%)	4(100%)

Table 5 shows that more children listed availability as the reason for selecting Tea and Bread/Andazi (58.9%) and friends influence as the reasons for selecting Ubuyu (56.5%) and Juice (53.8%).

Table 6

Frequency distribution of school children by common oral problems

ORAL PROBLEM	FREQUENCY
Toothache	205(35.1%)
Teeth sensitivity	101(17.3%)
Exfoliation	350(59.9%)
Teeth arrangement	49(8.4%)
Oral ulcer	124(21.2%)
Mouth bleeding	82(14%)
Swollen gum	115(19.7%)
Bad smell	66(11.3%)
Teeth color	44(7.5%)
Space between teeth	16(2.7%)

As shown in Table 6, exfoliation of deciduous teeth was the most common oral problem that they encounter (59.9%), followed by toothache (35.1%).

Table 7 Frequency distribution of school children by oral impacts

ORAL IMPACT	FREQUENCY
Eating and enjoying food	144(24.7%)
Speaking and pronouncing	51(8.7%)
Cleaning teeth	67(11.5%)
Sleeping and relaxing	54(9.2%)
Smiling	15(2.6%)
Maintaining normal emotion	22(3.8%)
Performing major school work	18(3.1%)
Enjoy contact	17(2.9%)
OIDP SUM SCORE	163(28%)

Table 7 shows that eating and enjoying food was the most common oral impact (24.7%) followed by cleaning teeth (11.5%). About 28% of school children had at least one oral impact.

Table 8

Frequency distribution of oral impacts in participants by DMFT, sugar moments, sex and age

DMFT	OIDP		χ^2	P-VALUE
	NO IMPACT	IMPACT		
Caries free	328(77.9%)	126(77.3%)	0.025	0.48
\geq One carious lesion	93(22.1%)	37(22.7%)		
SUGAR				
MOMENTS				
< 5 times a day	415(98.6%)	156(95.7%)	4.445	0.042
\geq 5 times a day	6(1.4%)	7(4.3%)		
SEX				
Male	207(71.9%)	81(28.1%)	0.013	0.49
Female	214(72.3%)	82(27.7%)		
AGE				
10-13YRS	356(71.6%)	141(28.4%)	0.350	0.33
14-17YRS	65(74.7%)	22(25.3%)		
TOTAL	421(72.1%)	163(27.9%)		

Table 8 shows that, there was no statistical significant difference in OIDP between children who were caries free and those who had at least one carious tooth ($\chi^2=0.025$, p-value=0.477). Also there was no statistical significant difference in oral impacts between sex and age groups ($\chi^2=0.013$, p-value=0.491 and $\chi^2=0.350$, p-value=0.326 respectively). However, more children with sugar moments five or more times a day (4.3%) had an oral impact compared to those with less than 5 times a day sugar moments (1.4%). The difference was statistically significant ($\chi^2=4.445$, p-value=0.042).

Table 9

Frequency distribution of oral impacts in participants by toothache, teeth sensitivity, exfoliation and bad mouth smell

	OIDP		X ²	P-VALUE
TOOTHACHE	NO IMPACT	IMPACT		
Yes	111(26.4%)	94(57.7%)	50.5	0.000
No	310(73.6%)	69(42.3%)		
<hr/>				
SENSITIVITY				
Yes	41(9.7%)	60(36.8%)	60.2	0.000
No	380(90.3%)	103(63.2%)		
<hr/>				
EXFOLIATION				
Yes	252(59.9%)	98(60.1%)	0.003	0.51
No	169(40.1%)	65(39.9%)		
<hr/>				
BAD SMELL				
Yes	37(8.8%)	29(17.8%)	9.5	0.002
No	384(91.2%)	134(82.2%)		
<hr/>				
ORAL ULCER				
Yes	62(14.7%)	62(38.0%)	38.2	0.000
No	359(85.3%)	101(62.0%)		
TOTAL	421(100%)	163(100%)		
<hr/>				

Table 9 shows that, there was a statistical significant difference in OIDP between those with and without toothache. More children with toothache (57.7%) had an oral impact compared to those with toothache but no toothache (42.3%), ($\chi^2=50.5$, p-value=0.000).

There was also a statistical significant difference in OIDP between those with and without teeth sensitivity. Those with impact and teeth sensitivity were more (36.8%) compared to those with sensitivity but no impact (9.7%), ($\chi^2=60.2$, p-value=0.000).

However there was no statistical significant difference in OIDP between those with exfoliation ($X^2=0.003$, p-value=0.51). Furthermore, there was a statistical significant difference in OIDP among those with bad mouth smell. More children with bad breath had an impact (17.8%) than those with no impact (8.8%), ($X^2=9.5$, p-value=0.002). There was also a statistical significant difference IODP among those with oral ulcer. More children with an oral ulcer had oral impact (38%) than those with no impact (14.7%), ($X^2=38.2$, p-value=0.000)

Table 10

Logistic regression of OIDP by age, sex, toothache, sensitivity, bad smell, oral ulcer and sugar moment

	P-VALUE	OR	95%CI
Age	0.435	0.86	1.44-0.43
Sex	0.103	0.70	1.07-0.46
Toothache	0.0001	1.91	1.53-2.37
Sensitivity	0.0001	1.99	1.56-2.55*
Bad smell	0.171	1.09	1.45-0.77
Sugar moments	0.134	2.13	7.83-0.61
Oral ulcer	0.0001	1.82	1.44-2.37*

* p - value ≤ 0.05

Table 10 shows that, having toothache, teeth sensitivity and oral ulcer was almost 2 times more likely to cause oral impact than their counterparts without such conditions.

Table 11

Distribution of caries experience (DMFT) in the participants

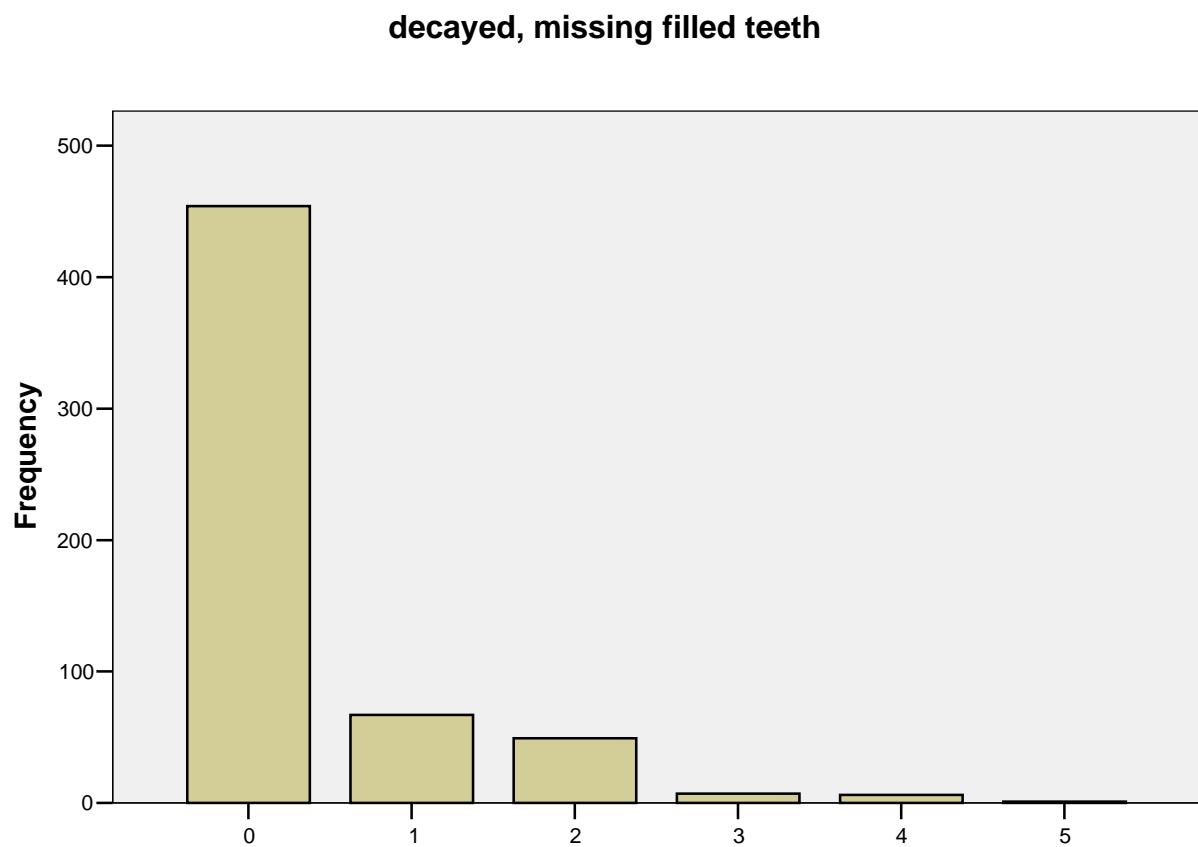
DMFT	FREQUENCY
0	554(77.7%)
1	67(11.5%)
2	49(8.4%)
3	7(1.2%)
4	6(1%)
5	1(0.2%)
TOTAL	584(100%)

Mean DMFT=0.37, where D= 0.32, M= 0.004 and F= 0.001

Table 11 shows that, the proportion of school children with at least one carious tooth was 22.3%, 11.5% had at least 1 DMFT while 0.2 had a DMFT of 5. The mean DMFT was 0.37. The mean decayed component was 0.32; the missing component was 0.04 while the filled component was 0.001.

Figure 2

Distribution of DMFT in the participants



In figure 2, majority of the participants with DMFT status, had DMFT of 1

Table 12

Frequency distribution of DMFT by age, sex and sugar moment of the participants

	DMFT		X ²	P-VALUE
SEX	0	1OR MORE		
Male	227(78.8%)	61(21.2%)	0.38	0.302
Female	227(76.7%)	69(23.3%)		
AGE				
10-13YRS	391(78.7%)	106(21.3%)	1.67	0.125
14-17YRS	63(72.4%)	24(27.6%)		
SUGAR MOMENT				
< 5	446(78.1%)	125(21.9%)	2.02	0.140
≥ 5	8(61.5%)	5(38.5%)		
TOTAL	454(77.7%)	130(22.3%)		

Table 12 shows that, about 77.7% of children had DMFT of 0 while 22.3% had DMFT 1 or more. However, there was no statistical significant difference in DMFT between sex, age groups and categories of sugar moments ($X^2=0.38$, $p\text{-value}=0.302$ and $X^2=1.67$, $p\text{-value}=0.125$, $X^2=2.02$, $p\text{ value}=0.140$ respectively).

7. Discussion

This study reports sugary snacks consumption, caries experience and oral quality of life among primary school children in Tanga Township. The findings of this study are applicable to children in the schools studied and not to all the primary schools in Tanga since the schools were selected by convenient sampling. Probability sampling allows each unit to have a known chance of being selected and hence the resulting sample would be representative of the target population. However this process is liable to logistic and cost implications that were outside the limits of this study. Nevertheless these findings may provide a reflection of the magnitude of snacking, caries experience and oral quality of life among primary school children in Tanga Township.

The participants were school children who may not remember what they ate in the past 24 hours. This might have resulted to some possibility of recall bias (Abramson, 1999, pg 300). Likewise because of seeking social desirability the children may have wanted to be considered good behavior performers and therefore may exaggerate or inflate their responses. As also reported by Klein et al,(1969) and Crandall et al, (1965), socially desirable responses are more frequently given by younger than by older children. In this study participants were school children aged 10 to 17 years therefore a possibility of them seeking social desirability can not be ignored. Inter examiner and intra examiner variability was not calculated in this study due to logistic limitations. This could have posed a threat to reliability of the findings, however caries scoring was done on obvious cavities and it was unlikely for an experienced dentist to make serious errors in scoring.

The sample size was calculated to allow sufficient power of the study and hence minimize possibility of error type two (Abramson, 1999, page 97)

Since this study involved face to face interview it was possible to clarify issues that were not clear to the respondents, although this might have limited the freedom of children to freely express themselves.

7.1 Magnitude of snacking

Since the Vipeholm study (Gustaffson et al., 1954) the main interest has been focused on the frequency of consumption of sugar-containing foods, which was an important factor for caries etiology. Having sugar moments about four to five times a day is associated with the occurrence of dental caries in a society that is not protected by fluoride (Burt et al 1988, Rodrigues et al., 2000, Kalsbeek et al., 1990 and Blicks et al., 1985). Therefore in health education, instructions about frequency of sugary snacks consumption are important. In this study a mean sugar moments of 1.93 times a day was obtained which is relatively low as it is far below the critical value of five times a day. This score is lower than those reported in Uganda, Nigeria and Scotland whereby the mean sugar moments among school children was 2.6, 4.9 and 2.8 respectively (Okullo et al., 2003; Olojugba et al., 1985 and Anderson et al., 1993). The reasons for the low sugar moments in this study as compared to those reported in Uganda, Nigeria and Scotland could be due to difference in methodologies used and the populations studied. In this study there was no significant difference in sugar moments between sex and age groups. Okullo et al, (2003) reported significantly higher sugar moments among females as compared to males and higher sugar moments among the younger children than the older ones. Blay et al., (2000) also reported higher frequency of sugary food consumption in females as compared to males. In the current study similarity in sugar moments between the age groups and sex could probably be explained by the fact that all children are treated in the same way irrespective of their gender. Besides due to limited access to sugared commodities probably both sexes would have equally restricted intake

The proportion of participants consuming sugary foods three or more times a day (27.9%) does not differ much with the previously reported studies in Tanzania. Nyandindi, (1988) reported a proportion of (21%) among seven year olds and above in Ilala urban and (13%) among their rural counterparts who consumed sugary food 3 or more times a day. Similarly Mazengo et al., (1997) reported a proportion of (27.1%) among 12 years old in Ilala urban and (15%) in rural consumed sugary food at least 3 times a day. In this study a smaller proportion had four or more sugar moments. Similar to what has been reported in another study in Tanzania by Mosha et al., (2005). The skewed nature of sugar moments

in this study and others in developing countries indicates that only a small proportion of individuals have an access to frequent intake of sugars. In some cases those who are economically well-off can afford to buy and consume sugary products more frequently. However in developed countries, those who are poor are the ones who consume more sugar than the affluent ones (Touger Decker et al., 2003).

The effect of diet on dental caries is being masked by the available preventive measures for dental caries. Reports from the past 2 decades have shown that a small percentage of the variance in caries increase may be explained by dietary components since the introduction and use of fluoridated toothpaste (Kalsbeek et al., 1994, Gibson et al, 1999, KleemolaKujala et al., 1997, Walker et al 1991 and Cleaton et al., 1984). The relation between sugars and dental caries is becoming difficult to quantify because of inherent limitations including 1) variability in patterns of sugars consumption affects the duration of exposure of the teeth to sugars, 2) dietary recalls or food diaries only provide an approximation of actual sugars consumption and food consumption patterns, 3) patterns of sugars consumption are reported on an annual basis but caries formation can take several years (König et al., 1995). In Tanzania a good proportion of individuals either do not use fluoridated tooth paste at all or they use it but not regularly, this is due to financial reasons (Kikwilu et al., 2008). It is therefore imperative to emphasize on all the known preventive measures including the use of fluoridated toothpastes, regular dental checkups, proper tooth brushing, without ignoring to maintain the low sugar consumption.

7.2 Commonly consumed snacks

Studies undertaken among the primary school children in Tanzania indicate low consumption of sugary foods but wide preference for them (Nyandindi, 1988; Normark et al., 1989; Nyandindi et al., 1994).

In this study majority of the participants consumed fried cassava (38.9%) followed by sugared juice (27.7%), maandazi (25.2%) and tea or porridge (17.3%). These contain less sugar as compared to ice creams, biscuits and cakes which were rarely consumed (0.7%). However, these results differ from those reported by Masalu et al., (2009) among a national sample of Tanzanian adults whereby the commonly consumed sugared snacks

included biscuits/cakes (44.6%), chewing gums (54.6%), sweets/chocolates (48.6%) and soft drinks (25.5%). In the national sample participants were asked to indicate which sugared items were consumed at least once a week, whereas in the present study the children were asked by using a twenty hour-recall method in which a variety of food items were mentioned making the studies not directly comparable. The results from this study also differ with those reported by Blay et al., (2000) among adolescents in Ghana who commonly consumed sugared coffee or tea 66.4%, chocolates or sweets 32.5%, cakes and biscuits 31.8% and soda 29%. The reasons for the above differences could be due to the age difference among the study participants in this study and the compared studies. While this study involved primary school children, the other studies involved adults and secondary school students who are older and probably more socio economically advantaged than primary school children. Furthermore, the reasons for the observed differences in the results could be the difference in the methodology used. A 24 hours dietary recall was used in the present study while other studies used a food frequency questionnaire. Most participants in the current study reported to consume snacks that were sold at school compound. Since school children spend most of their day time at school, restricting selling of sugary food within school compounds and promoting the sell of non sugary food should be continuously encouraged to reinforce the positive habits for the prevention of dental caries.

7.3 Reasons for snacking and snacks selection

The effect of frequent sugary snacks on teeth and the need to balance demineralization with remineralization are well understood by dental professionals (Lytle et al., 2000). Therefore family, school, and community-wide efforts are needed to promote healthy eating patterns and food choices. Many young adults eat snacks, replacing the three main meals due to economic activities, i.e. working distance (people work far from where they live as a result can not go home for lunch) and school children are enrolled far from their homes hence they can not go home for their lunch. The lack of proper main meals may result in frequent hunger and grazing eating pattern where individuals eat small amounts of a variety of foods all day long. This eating pattern often does not leave enough time for teeth to recover from acid attack and for remineralization to occur. Earlier reports

indicated that the frequency of consumption seemed to be a significant contributor to the cariogenicity of the diet (Gustaffson et al., 1954; Grytten et al., 1988; König et al., 1968; Firestone et al., 1982; and Bowen et al., 1983), although Bowen et al., 1983 concluded that it is not the frequency of ingestion per se that is related to the development of caries but the time that sugars are available for microorganisms in the mouth. The importance of frequency is clear when caries is regarded as the outcome of the alteration between demineralization and remineralization. Higher frequency of sugar intake means more demineralization and less remineralization. However in this era of fluorides in dentistry it is becoming clearer that fluorides enhance remineralization and once remineralized with hydroxylfluoroapatite the enamel becomes more resistant to acid attack (Ten Cate et al., 2008). Thus the use of fluoridated toothpaste should be emphasized.

In this study majority of the participants listed hunger as the reason for drinking tea or porridge (88.6%) while (58.6%) listed hunger as the reason for eating fried cassava. More over, (54.2%) listed thirsty as the reason for drinking juice. This indicates that hunger and thirsty were their main reasons for snacking. Availability of snacks was the main reason the participants listed that influenced snack selection. Few participants listed friends influence, good taste and cost to influence snacking and snack selection. This indicates that most of the participants eat what is available to curb their hunger and thirst. The present results differ to those reported by Oogarah-pratap et al., (2005) and Adair et al., (2005) among adolescents who listed availability, good taste and amount of pocket money as the reasons influencing them to snack and select variety of snacks. In addition these results differ from those reported by Savige et al., (2007) and Freeman et al., (2002) who found that, being adolescents, increased number of vending machines and sales promotion influenced snacking and snacks selection. The observed difference may be due to socio cultural variations of the populations investigated. The findings of this study can help in making by-laws that restrict the selling of sugary snacks within school premises and promote the availability of healthy food that will alleviate hunger and thirsty.

7.4 Oral quality of life

About 28% of the participants had at least one oral impact. These results are similar to those reported by Mtaya et al., (2007) among primary school children in Dar es Salaam Tanzania. However the prevalence of oral impact in this study was lower as compared to

that reported by Masalu et al., (2002) among Tanzanian adults and Mbawalla et al., (2010) among 12-21 years old Tanzanian. The prevalence of oral impact on daily performance among school children in Sudan was reported to be 54.6% (Nurelhuda et al., (2010)). Nuca et al, (2005) also reported a high prevalence (64.9%) of oral impact on daily performance among 12 years old in Romania. The difference in the prevalence of oral impact observed when comparing this study to the previous studies could be due to variations in levels of oral diseases in the studied population. Since dental caries has a cumulative effect, the higher the age the more likely oral impacts are to be reported. Additionally, socio cultural variations between Tanzanian and other countries might account to the observed differences. Stéphanie et al., (2005) reported that the Child-OIDP score was able to discriminate between different socio-demographic groups and varied according to dental status, However Astrom and Mtaya, (2009) reported a cross-cultural equivalence of the OIDP, suggesting that the index could be comparable, at least to some extent.

Eating and enjoying food was the most common oral impact reported by the present participants followed by cleaning teeth, similar findings were observed previously (Mtaya et al., 2007; Masalu et al., 2002; Nurelhuda et al., 2010; Mihaela et al., 2009).

Moreover, as compared to other reports by Mtaya et al, (2007), Mihaela et al, (2009) and Al castro et al, (2008), exfoliation of deciduous teeth was the most common oral problem. However, this problem may be overlooked since it is a natural process that cannot be avoided at this age which will subside with increasing age. The second most reported impairment was toothache followed by oral ulcer. Therefore emphasis should be put on minimizing these impairments which were the major contributors of oral impact on daily performance.

Children's concern about their aesthetic appearance becomes significant when they approach adolescence (Smolak, 2004). Contrary to this, the current study suggested that oral appearance was not one of the main concerns of this population because the two least reported impacts were on the social performances, namely; social contact and smiling. Conditions that lead to concerns about aesthetic appearance (Xiao et al., 2007 and Hamamci et al., 2009); were probably not prevalent in this group, for example anterior cavities and missing teeth, discoloration or orthodontic problems. Factors such as age,

sex, sugar moments, toothache, teeth sensitivity, oral ulcer and halitosis are known to predict oral impact on daily performance. Individuals with such factors as compared to those without such factors were two times more likely to have an impact on at least one daily performance in this study presently. On the other hand Mtaya et al., (2007) reported oral health perception and oral problems being the strongest predictors of oral impacts.

7.5 Caries experience

Prevalence of dental caries was 22.3% and the DMFT was 0.37. This shows that dental caries experience among the investigated school children in Tanga Township is below the WHO millennium global goal. These results are similar to those reported by Mosha et al., (2005) who found a prevalence of 20% and DMFT of 0.4 among 12 years old in Tanzania. However, caries experience in this study is low as compared to those reported in European countries, For example in Albania the DMFT among 12 years old in 2005 was 3.1, in Bulgaria it was 4.4 in the year 2000 and in Belgium it was 1.1 in 2001 (The oral health atlas FDI World Dental Federation in 2009). This variation could be explained by the fact that sugar consumption in European and other developed countries especially among poor societies is high compared to developing countries including Tanzania (Downer et al, 2008; Diehnelt and Kiyak, 2001). Nevertheless, caries experience has been declining in developed countries without the decline in sugar consumption; for example in Finland the DMFT among 15 years old declined from 12.1 to 5.1 from 1976 to 1986 (Vehkalahti et al., 1990) this is due to the use of fluorides and other factors such as increased dental awareness, increased availability of dental resources, introduction of dental health education programs, improved preventive approaches in dental practices, changed diagnostic criteria (Petersson et al., 1996).

There was no correlation between sugar moments and DMFT in this study as it has been reported in many studies in Tanzania. This could probably be due to the fact that, the sugar moments of the participants vary from day to day, as we only asked what they ate in the past 24 hours. Thus, what they responded may not have provided the true regular dietary pattern. There could also be other factors such as failure of the participants to brush their teeth using fluoridated toothpaste which may have influenced the development of dental caries, but these were not investigated in this study. Caries and sugar consumption in the 21st century no longer represents a linear relationship, as poor

correlations between total sugar consumption and caries prevalence, in the communities are now being reported (Harel et al., 1996). Restriction of sugar consumption is considered a major caries-preventive measure, but also the use of fluorides, regular dental check ups and education on oral hygiene practices play more important roles (Anderson et al 2009). Equally important is for policy makers in Tanzania to integrate oral health into general health by using a common risk factor approach to prevent other diet related diseases since frequent sugar consumption does not only cause dental caries but also other diseases such as cardiovascular diseases. The key concept underlying the common risk factor approach is that, promoting general health by controlling a small number of risk factors may have a major impact on a large number of diseases at a lower cost, greater efficiency and effectiveness than the disease specific approaches.

8. Conclusion

Sugary snacks consumption was low; the commonly consumed snacks were fried cassava and sugared juice with hunger being the major reason for snacking. The snacks were consumed because they were available within the school premises. The prevalence of Caries and oral impacts on daily performance were also low. Toothache, teeth sensitivity and oral ulcer predicted oral impact on daily performance. Nevertheless there was no correlation between sugar moments and caries experience.

9. Recommendations

Although sugary snacks consumption, caries experience and prevalence of oral impact on daily performance were low, school oral health education program, restriction of selling sugary snacks and promoting the sell of healthy snacks and provision of school lunch is still recommended to maintain the diseases at low level

Further researches are needed to study the current relationship between sugar moments and caries experience incorporating other factors which may have influence in the formation of dental caries in Tanzania.

10. References;

1. The American Heritage® Stedman's Medical Dictionary 2002
2. Evans, D. L. Snacks - History and Recipes 2008, Retrieved May 24, 2010, from <http://ezinearticles.com>.
3. <http://en.wikipedia.org/.../Snack food>. Accessed on 17th December 2009
4. http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/using-utiliser/snacks-collations/index_e.html). Accessed on 17th December 2009.
5. Sugar Experiments of Mental Patients, 1947-1949. Sweden.www.medicalnewstoday.com/.../40759.php.
6. Gustafsson et al. The Vipeholm Dental Caries Study. Survey on the literature on carbohydrates and dental caries(1954). Acta Odontol Scand 1 1:207-231.
7. Maiwald HJ et al The effects on caries in animal experiments when reducing sugar in cola-drinks Zahn Mund Kieferheilkd Zentralbl. 1979; 67 (6):572-8.
8. Anderson et al. Sugar and dental caries obesity reviews (2009) 10 (Suppl. 1), 41–54
9. Burt BA et al The effects of sugars intake and frequency of ingestion on dental caries increment in a three-year longitudinal study. J Dent Res 1988; 67: 1422–1429
10. Hartles RL, carbohydrate consumption and dental caries. American journal of clinical nutrition.1967; 20(2) : 152-156.

11. Angelillo IF et al Caries and fluorosis prevalence in communities with different concentrations of fluoride in the water. *Caries Res* 1999; 33: 114–122.
12. Rodrigues CS, Sheiham A. The relationship between dietary guidelines, sugar intake and caries in primary teeth in low income Brazilian 3-year-olds: a longitudinal study. *Int J Paediatr Dent* 2000; 10: 47–55.
13. Kalsbeek H, Verrips GH. Dental caries prevalence and the use of fluorides in different European countries. *J Dent Res* 1990; 69:728–32.
14. Blicks et al, Dental health, dental care, dietary habits in children in different parts of Sweden. *Acta Odontol Scand* 1985; 43:59–67.
15. Rugg Gunn et al, Relationship between dietary habits and caries assessed over two years in 405 English adolescent school children. *Arch Oral Biol* 1984; 29:983–92.
16. Fisher FJ. A field study of dental caries, periodontal disease and enamel defects in Tristan da Cunha. Part 2. Methods and Results. *Br Dent J* 1968; 125: 447–45
17. Harris R. Biology of the children of Hopwood House, Bowral Australia. 4. Observations on dental-caries experience extending over 5 years (1957–61). *J Dent Res* 1963; 42: 1387–1399.
18. Mazengo CM et al, Dental caries in relation to diet, saliva and cariogenic microorganisms in Tanzanians of selected age groups. *Community Dent Oral Epidemiol* 1996; 24:169–174.
19. Bagramian et al The global increase in dental caries. A pending public health crisis *Am J Dent* 2009;22:3-8
20. Serra-Majem L et al, Dietary habits and dental caries in a population of Spanish school children with low levels of caries experience. *Caries Res* 1993; 27: 488–494.
21. Paes Leme AF et al, The role of sucrose in cariogenic dental biofilm formation-- new insight *J Dent Res*. 2006 Oct; 85(10):878-87.
22. Gift HC, Reisine ST, Larach DC: The social impact of dental problems and visits. *Am J Public Health* 1992, 82(12):1663-1668.
23. Mosha et al Oral health status and treatment needs among Tanzanians of different age groups. *Tanzania Dental Journal Vol. 12(1) 2005: 18-27*

24. Kiwanuka SN: Sugar snack consumption, caries experience and dental pain: surveys of 3-5 and 10-14-year-old children in Uganda. PhD Thesis. Volume PhD. Bergen, University of Bergen, Norway; 2006.
25. Connolly MA, Johnson JA: Measuring quality of life in paediatric patients. *Pharmacoeconomics* 1999, 16(6):605-625
26. Jokovic A et al Validity and reliability of a questionnaire for measuring child Oral-health-related quality of life. *J Dent Res* 2002, 81(7):459-463.
27. Yusuf H, et al Validation of an English version of the Child-OIDP index, an oral healthrelated quality of life measure for children. *Health Qual Life Outcomes* 2006, 4:38.2
28. Mtaya et al Applicability of an abbreviated version of the child OIDP inventory Among primary school children in Tanzania. *Health Qual Life Outcomes*, 2007 5:40 doi: 10.1186/1477-7525-5-40
29. Aires CP et al Effect of starch and sucrose on dental biofilm formation and on root dentine demineralization. *Caries Res.* 2008; 42(5):380-6
30. Moynihan P, Petersen PE. Diet, nutrition and the prevention of dental diseases. *Public Health Nutr* 2004. ; 7:201-26.
31. Zizza C et al Significant increase in young adults' snacking between 1977-1978 and 1994-1996 represents a cause for concern. *Prev Med.* 2001; 32:303-10.
32. Macintyre S, West P. Adolescent meal patterns: grazing habits in the west of Scotland *Health Bull (Edinb)*.1993; 51:158-65
33. Marques-Vidal P et al Trends of food intake in Portugal, 1987-1999: results from the National Health Surveys. *Eur J Clin Nutr.*2006; 60:1414-22.
34. Adair LS, Popkin BM Are child eating patterns being transformed globally? *Obes Res.* 2005; 13:1281-99.
35. Olojugba OO, Lennon MA. Sugar consumption in 5 and 12-year-old school children in Ondo State, Nigeria. *Community Dent Health.*1985; 7:259-65.
36. Okullo I et al Variation in caries experience and sugar intake among secondary school students in urban and rural Uganda. *Acta Odontol Scand.* 2003; 6:197-202
37. Ursuline S.Nyandindi, Oral health habits in the district of Ilala, Tanzania. Publication of the division of dentistry university of Dar es salaam. 1989

38. Normark S.Relationship between habits and dental health among rural Tanzanian Children.Community Dent Oral Epidemiol .1989, 17; 317-21
39. Mazengo MC Food consumption in rural and urban Tanzania Acta Tropica 68 (1997) 313–326
40. Nordrehaug Åstrøm and Joyce Rose Masalu Oral health behavior patterns among Tanzanian university students BMC Oral Health 2001, 1:2
41. Masalu et al Oral health related behaviors among adult Tanzanians: a national pathfinder survey BMC Oral Health 2009, 9:22 doi:10.1186/1472-6831-9-22
42. Oogarah-Pratap et al Children's consumption of snacks at school in Mauritius Nutrition & Food Science 2005: 35 : 1 : 15 – 19
43. Savige G et al Snacking behaviours of adolescents and their association with skipping meals. Int J Behav Nutr Phys Act.2007, 17; 4:36
44. Freeman R et al. Determinants of cariogenic snacking in adolescents in Belfast and Helsinki. Eur J Oral Sci.2002 ;108:504-10.
45. Sun WJ and Gao YQ. Factors influencing snack behaviours of young children in Hefei and evaluation of the effect of interventions Wei Sheng Yan Jiu. 2006; 35:615-7.
46. Mesters I,Oostveen T. Why do adolescents eat low nutrient snacks between meals? An analysis of behavioral determinants with the Fishbein and Ajzen model. Nutrition and health 1992, vol. 10,, pp. 33-47 (1 p.1/4)
47. Grogan SC et al Eating Sweet Snacks: Gender Differences in Attitudes and Behaviour Appetite.1997; 28:19-31.
48. Masalu JR, Åstrøm AN: Social and behavioral correlates of oral quality of life studied among university students in Tanzania. Acta Odontol Scand 2002, 60:353-9.
49. Mbawalla et al.: Socio-demographic and behavioural correlates of oral hygiene status and oral health related quality of life, the Limpopo - Arusha school health project (LASH): A cross-sectional study. BMC Pediatrics 2010 10:87
50. Nurelhuda et al.: Evaluation of oral health-related quality of life among Sudanese schoolchildren using Child-OIDP inventory. Health and Quality of Life Outcomes 2010 8:152.

51. Nuca et al Study regarding the correlation between the Child-OIDP index and the dental status in 12-year-old children from Harsova, Constanta county OHDMBSC - Vol. IV - No. 4 - December, 2005
52. Abramson, survey methods in community medicine Fifth edition 1999
53. Crandall VC et al, A children's social desirability questionnaire. *J Consult Psychol.* 1965; 29:27–36.
54. Klein EB et al, Social desirability in children: an extension and replication. *J Consult Clin Psychol.* 1969; 33:128.
55. Kalsbeek H, Verrips GH. Consumption of sweet snacks and caries experience of primary school children. *Caries Res* 1994; 28:477–83.
56. Blay D et al, Oral hygiene and sugar consumption among urban and rural adolescents in Ghana. *Community Dent Oral Epidemiol* 2000; 28: 443–50.
57. Riva Touger-Decker et al, Sugars and dental caries *Am J Clin Nutr* 2003; 78(suppl):881S–92S.
58. Gibson S, Williams S. Dental caries in pre-school children: associations with social class, toothbrushing habit and consumption of sugars and sugar-containing foods. Further analysis of data from the national diet and nutrition survey of children aged 1.5–4.5 years. *Caries Res* 1999; 33:101–13.
59. KleemolaKujala E, Räsänen L. Dietary patterns of Finnish children with low and high caries experience. *Commun Dent Oral Epidemiol* 1979; 7:199–205
60. Walker et al. Dental caries in South African black and white high school pupils in relation to sugar intake and snacks habit. *Commun Dent Oral Epidemiol* 1981; 9:37–43.
61. Cleaton-Jones et al, Dental caries, sucrose intake and oral hygiene in 5-year-old South African Indian children. *Caries Res* 1984; 18:472–7.
62. König KG, Navia J. Nutritional role of sugars in oral health. *Am J Clin Nutr* 1995; 62(suppl):275S–83S.
63. Emil N. kikwili, utilization of toothpaste and fluoride content in toothpaste manufactured in Tanzania. *acta odontologica scandinavica*, 2008; 66: 293_299
64. Lytle LA et al, How do children's eating patterns and food choices change over time? Results from a cohort study. *Am J Health Promot*. 2000; 14(4):222-8.

65. Grytten J et al, Steels L. Longitudinal study of dental health behaviors and other predictors in early childhood. *Commun Dent Oral Epidemiol* 1988; 16:356–9.
66. König KG et al, An apparatus for frequency controlled feeding of small rodents and its use in dental caries experiments. *Arch Oral Biol* 1968; 13:13–26.
67. Firestone AR et al Cariogenic effects of cooked wheat starch alone or with sucrose and frequency-controlled feedings in rats. *Arch Oral Biol* 1982;27:759–63
68. Bowen WH et al. Effects of varying intervals between meals on dental caries in rats. *Caries Res* 1983; 17:466–71
69. Ten Cate et al Elevated fluoride products enhance remineralization of advanced enamel lesions *J Dent Res*. 2008 Oct; 87(10):943-7.
70. Stéphanie et al Validation of a French version of the Child-OIDP index. *European Journal of Oral Sciences*. Volume 113, Issue 5, pages 355–362, October 2005
71. Mihaela et al life quality related to oral health of schoolchildren from Bucharest. *Romanian Journal of Bioethics*, Vol. 7, No. 4, October – December 2009
72. Al castrol et al Child-OIDP index in Brazil: Cross-cultural adaptation and Validation *Health and Quality of Life Outcomes* 2008, 6:68 doi:10.1186/1477-7525-6-68
73. Normark S.Relationship between habits and dental health among rural Tanzanian Children.*Community Dent Oral Epidemiol* .1989, 17; 317-21
74. Åstrøm AN, Mtaya M .Factorial structure and cross-cultural invariance of the Oral Impacts on Daily Performances. *European Journal of Oral Sciences Journal of Oral Sciences* Volume 117, Issue 3, pages 293–299, June 2009
75. Smolak L: Body image in children and adolescents: where do we go from here? *Body Image* 2004, 1:15-28.
76. Hamamci et al Dental Aesthetic Index scores and perception of personal dental appearance among Turkish university students *European Journal of Orthodontics* 1 of 6 doi:10.1093/ejo/cjn083
77. Xiao et al The prevalence of tooth discoloration and the self-satisfaction with tooth color in a Chinese urban population *China Journal of Oral Rehabilitation* 2007 34; 351–360
78. The oral health atlas FDI World Dental Federation in 2009

79. Downer MC et al. Correlates of dental caries in 12-year-old children in Europe: a cross-sectional analysis. *Community Dent Health.* 2008 Jun; 25(2):70-8.
80. Diehnelt DE, Kiyak HA. Socioeconomic factors that affect international caries levels. *Community Dent Oral Epidemiol.* 2001 Jun;29(3):226-33.
81. M. Vehkalahti et al, Caries Decline from 1976 to 1986 among 15-Year-Olds in Helsinki *Caries Res* 1990;24:279-285 (DOI: 10.1159/000261283)
82. Petersson GH, Bratthall D. The caries decline: a review of reviews. *Eur J Oral Sci* 1996;104:436–43
83. Harel-Raviv M et al, Dental caries and sugar consumption into the 21st century. *Am J Dent* 1996; 9: 184–190.

11. Appendices

11.1 Consent form (English version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES



**DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS
INFORMED CONSENT FORM**

ID-NO.

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Consent to Participate in a Study

Greetings! My name is Dr Rajab Sasi; I am working on this research with the objective of determining the prevalence of snacking and the factors that influence adolescents to snack in Tanga urban.

Purpose of the study

The study is conducted in partial fulfillment of the requirements for the degree of Master of Dentistry in Preventive and community dentistry of MUHAS. This study is aiming to determine the prevalence of snacking, factors influencing adolescent to snack and factors influencing snack selection among adolescents in primary schools. You are being asked to participate in this study because you have particular knowledge and experiences that may be important to the study. Kindly please be honest and true for betterment of the results that could lead to better intervention and recommendations for future.

What Participation Involves

If you agree to join the study, you will be interviewed in order to answer a series of questions in the questionnaire prepared for the study.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Your name will not be written on any questionnaire or in any report/documents that might let someone identify you. Your name will not be linked with the research information in any way. All information collected on forms will be entered into computers with only the study identification number. Confidentiality will be observed and unauthorized persons will have no access to the data collected.

Risks

We do not expect that any harm will happen to you because of participating in this study. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and may stop the interview at anytime.

Right to Withdraw and Alternatives

Taking part in this study is completely voluntary. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty.

Benefits

The information you provide will ascertain the magnitude of snacking among primary school children and therefore aiding the decision to intervene.

Factors influencing snacking will reveal the rein forcers and deterrents of snacking behavior. Therefore in intervention the rein forcers will be discouraged while the deterrents will be encouraged. Those found with dental caries and other dental problems will be advised to report to the nearest dental clinic for appropriate management.

Who to Contact

If you ever have questions about this study, you should contact the Principal Investigator, Dr Rajab Sasi of Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam.

If you ever have questions about your rights as a participant, you may call, Chairperson of the Senate Research and Publications Committee, P. O. Box 65001, Telephone : 255 22 2152489 Dar es Salaam and Dr JR Masalu who is the supervisor of this study (Tel.0754757577) and Dr EN Kikwili who is Co-Supervisor (Tel 0715893527)

Signature:

Do you agree?

Participant agrees Participant does NOT agree

I have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant

Signature of Research Assistant

Date of signed consent

11.2 Consent form (Kiswahili version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI



KURUGENZI YA TAFITI NA UCHAPISHAJI

FOMU YA RIDHAA

Namba ya utambulisho

Ridhaa ya kushiriki kwenye utafiti

Hujambo! Ninaitwa Dr Rajab Sasi, nashughulika kwenye utafiti huu wenyewe lengo la kutathmini ulaji wa vyakula nje ya milo mikuu na sababu zinazopelekea ulaji na uchaguzi wa vyakula hivyo kwa wanafunzi wa shule za msingi mjini Tanga. Utafiti huu unafanyika katika kutimiza sehemu ya matakwa ya shahada ya uzamili ya kinga ya mangonjwa ya kinywa na meno ya Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili. Utafiti unalenga kuchunguza kiwango cha ulaji wa vyakula nje ya milo mikuu na sababu zinanopelekea ulaji na uchaguzi wa vyakula hivyo kwa wanafunzi wa shule za msingi mjini Tanga. Unaombwa kushiriki katika utafiti huu kutokana na upeo na ufahamu ulio nao ambavyo ni muhimu kwa utafiti huu. Tafadhalii kuwa mkweli na muwazi kwa vile matokeo ya utafiti huu yanaweza yakatoa maamuzi na mapendekezo ya baadaye.

Jinsi ya kushiriki

Ukikubali kushiriki katika utafiti huu, utasailiwa ili kuweza kujibu maswali toka kwenye dodoso lililoandalowiwa kwa ajili ya utafiti huu.

Usiri

Taarifa zote zitakazokusanywa kupitia dodoso zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho. Kutakuwa na usiri na hakuna mtu yejote asiyehusika atakayepata taarifa zilizokusanywa.

Hatari

Hututegemei madhara yoyote kukutokea kwa kushiriki kwako kwenye utafiti huu.

Faida

Kama utakubali kushiriki kwenye utafiti huu taarifa utakazotoa zitatuwezesha kujua kiwango au ukubwa wa tatizo amba ni muhimu katika uamuzi wa kuzuia au kupunguza tatizo. Watakaogundulika kuwa na meno yaliyooza au matatizo mengine ya kinywa na meno watashauriwa kwenda hospitali iliyokaribu kwenda kutibiwa.

Athari na kukutokea madhara

Hutegemewi kupata madhara yoyote kutokana na ushiriki wako katika utafiti huu. Baadhi ya maswali yanaweza yasikupendeze, unaweza kukataa kujibu swali lolote la aina hiyo na unaweza kuamua kusimamisha udahili wakati wowote.

Uhuru wa kushiriki na haki ya kujitoa

Kushiriki kwenye utafiti huu ni hiari. Unaweza kujitoa kwenye utafiti huu wakati wowote hata kama umeshajaza fomu ya ridhaa ya kushiriki utafiti huu. Kukataa kushiriki au kujitoa kwenye utafiti huu hakutaambatana na masharti yoyote.

Nani wa kuwasiliana naye

Kama una maswali kuhusiana na utafiti huu, wasiliana na Mtafiti mkuu wa utafiti huu, Dr Rajab Sasi wa Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S. L. P. 65001, Dar es Salaam.

Kama una swali kuhusu stahili zako kama mshiriki unaweza kumpigia simu Prof. E.F. Lyamuya, Mwenyekiti wa kamati ya Utafiti na Uchapishaji, S.L.P 65001, Simu: 255 22 2152489 Dar es Salaam au msimamizi wa utafiti huu Dr JR Masalu (Simu: 0754757577) au msimamizi msaidizi Dr EN Kikwilu (Simu ; 0715893527)

Sahihi:

Je umekubali?

Mshiriki amekubali Mshiriki hajakubali

Mimi nimesoma maelezo ya fomu hii.

Maswali yangu yamejibiwa.Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki.....

Sahihi ya mtafiti msaidizi.....

Tarehe ya kutia sahihi ya idhini ya kushiriki.....

11.3 Questionnaire (English version)

1. PUPIL'S NAME.....

2. SCHOOL.....

3. CLASS.....

4. AGE.....

5. GENDER.....

6. 24 HOURS DIETARY RECALL

Time at which food was consumed	Food consumed	Reasons for consuming food	Reasons for food selection
What did you eat when you woke up before going to school			
What did you eat on your way to school			
What did you eat at school before going to class			
What did you eat in the class before the break			
What did you eat during the break			
What did you eat in the class after the break			
What did you eat during the afternoon break			
What did you eat in the class after the break			
What did you eat on your way home			
What did you eat at home before lunch			
What did you eat at home before super			
What did you eat at home before going to bed			

7. Think back on the past previous 3 months, have you experienced the following?

- i) Toothache? a) yes b) No
- ii) Sensitive teeth? a) yes b) No
- iii) Tooth exfoliation? a) yes b) No
- iv) Problems with the positioning of your teeth? a) yes b) No
- v) Ulcer in your mouth? a) yes b) No
- vi) Bleeding in the mouth? a) yes b) No
- vii) Swollen gums? a) yes b) No
- viii) Bad breath? a) yes b) No
- ix) Problems with the colour of your teeth? a) yes b) No
- x) Problems with spaces of your teeth? a) yes b) No

8. During the past 3 months did you experience difficult while eating

- a)Never
- b)Once or twice a month
- c)Once or twice a week
- d)Every day

9. What was the actual oral problem(s) that caused your difficulty with **eating and enjoying food?**

Condition	Yes	No
Toothache		
Sensitive teeth		
Tooth exfoliation		
Problems with the positioning of your teeth		
Ulcer in the mouth		
Bleeding in the mouth		
Swollen gums		
Bad breath		
Problems with the colour of your teeth		
Problems with spaces between your teeth		
Other problems		

10. During the past 3 months did you experience difficulty in **speaking and pronouncing clearly?**

- a)Never
- b)Once or twice a month
- c)Once or twice a week
- d)Every day

11. What was the actual oral problem(s) that caused your difficulty with **speaking and pronouncing clearly?**

Condition	Yes	No
Toothache		
Sensitive teeth		
Tooth exfoliation		
Problems with the positioning of your teeth		
Ulcer in the mouth		
Bleeding in the mouth		
Swollen gums		
Bad breath		
Problems with the colour of your teeth		
Problems with spaces between your teeth		
Other problems		

12 . During the past 3 months did you experience difficulty with **cleaning teeth?**

- a)Never
- b)Once or twice a month
- c)Once or twice a week
- d)Every day

13. What was the actual oral problem(s) that caused your difficulty with **cleaning teeth?**

Condition	Yes	No
Toothache		
Sensitive teeth		
Tooth exfoliation		
Problems with the positioning of your teeth		
Ulcer in the mouth		
Bleeding in the mouth		
Swollen gums		
Bad breath		
Problems with the colour of your teeth		
Problems with spaces between your teeth		
Other problems		

14. During the past 3 months did you experience difficulty with **sleeping and relaxing?**

- a)Never
- b)Once or twice a month
- c)Once or twice a week
- d)Every day

15. What was the actual oral problem(s) that caused your difficulty with **sleeping and relaxing?**

Condition	Yes	No
Toothache		
Sensitive teeth		
Tooth exfoliation		
Problems with the positioning of your teeth		
Ulcer in the mouth		
Bleeding in the mouth		
Swollen gums		
Bad breath		
Problems with the colour of your teeth		
Problems with spaces between your teeth		
Other problems		

16. During the past 3 months did you experience difficulty with **smiling laughing and showing teeth without embarrassment?**

- a)Never
- b)Once or twice a month
- c)Once or twice a week
- d)Every day

17. What was the actual oral problem(s) that caused your difficulty with **smiling laughing and showing teeth without embarrassment?**

Condition	Yes	No
Toothache		
Sensitive teeth		
Tooth exfoliation		
Problems with the positioning of your teeth		
Ulcer in the mouth		
Bleeding in the mouth		
Swollen gums		
Bad breath		
Problems with the colour of your teeth		
Problems with spaces between your teeth		
Other problems		

18. During the past 3 months did you experience difficulty with **maintaining usual emotional state without being irritable?**

- a)Never
- b)Once or twice a month
- c)Once or twice a week
- d)Every day

19. What was the actual oral problem(s) that caused your difficulty with **maintaining usual emotional state without being irritable?**

Condition	Yes	No
Toothache		
Sensitive teeth		
Tooth exfoliation		
Problems with the positioning of your teeth		
Ulcer in the mouth		
Bleeding in the mouth		
Swollen gums		
Bad breath		
Problems with the colour of your teeth		
Problems with spaces between your teeth		
Other problems		

20. During the past 3 months did you experience difficulty with **carrying out major school work or social role?**

- a) Never
- b) Once or twice a month
- c) Once or twice a week
- d) Every day

21. What was the actual oral problem(s) that caused your difficulty with **carrying out major school work or social role?**

Condition	Yes	No
Toothache		
Sensitive teeth		
Tooth exfoliation		
Problems with the positioning of your teeth		
Ulcer in the mouth		
Bleeding in the mouth		
Swollen gums		
Bad breath		
Problems with the colour of your teeth		
Problems with spaces between your teeth		
Other problems		

22. During the past 3 months did you experience difficulty with **enjoying contact with people?**

- a) Never
- b) Once or twice a month
- c) Once or twice a week
- d) Every day

23. What was the actual oral problem(s) that caused your difficulty with **enjoying contact with people?**

Condition	Yes	No
Toothache		
Sensitive teeth		
Tooth exfoliation		
Problems with the positioning of your teeth		
Ulcer in the mouth		
Bleeding in the mouth		
Swollen gums		
Bad breath		
Problems with the colour of your teeth		
Problems with spaces between your teeth		
Other problems		

24 .CLINICAL FORM FOR ASSESSMENT OF CARIOUS STATUS

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Key: 0=Sound, 1=decay, 2=filled with decay, 3=filled with no decay, 4=missing due to caries.

11.4 Questionnaire (Kiswahili version)

1. Jina
2. Shule.....
3. Darasa.....
4. Umri.....
5. Jinsia.....

6. CHAKULA KILICHOLIWA MASAA 24 YALIYOPITA

Muda chakula kilipoliwa	Chakula kilicholiwa	Sababu za kula chakula	Sababu za kuchagua aina hiyo ya chakula
Ulikula nini asubuhi ulipoamka kabla hujaenda shule			
Ulikula nini ukiwa njiani kuelekea shule			
Ulikula nini ukiwa shulenii kabla hujaingia darasani			
Ulikula nini ukiwa darasani kabla ya mapumziko			
Ulikula nini wakati wa mapumziko			
Ulikula nini ukiwa darasani kabla ya mapumziko ya mchana			
Ulikula nini ukiwa darasani baada ya mapumziko ya mchana.			
Ulikula nini ukiwa njiani kuelekea nyumbani			
Ulikula nini chakula cha mchana			
Ulikula nini kabla ya chakula cha jioni			
Ulikula nini chakula cha jioni			
Ulikula nini baada ya chakula cha jioni kabla hujalala			

7. Fikiria nyuma katika miezi mitatu iliyopita, umeshapata lolote kati ya haya yafuatayo?

- i) Maumivu ya jino? a) Ndiyo b) Hapana
- ii) Meno kufa ganzi? a) Ndiyo b) Hapana
- iii) Kung'oka kwa meno ya utoto? a) Ndiyo b) Hapana
- iv) Matatizo ya namna meno yalivyokaa? a) Ndiyo b) Hapana
- v) Kidonda kwenye mdomo? a) Ndiyo b) Hapana
- vi) Kutoka damu kwenye mdomo? a) Ndiyo b) Hapana
- vii) Fizi kuvimba? a) Ndiyo b) Hapana
- viii) Harufu mbaya mdomoni? a) Ndiyo b) Hapana
- ix) Matatizo ya rangi ya meno yako? a) Ndiyo b) Hapana
- x) Matatizo ya nafasi katika meno yako? a) Ndiyo b) Hapana

8. Katika miezi mitatu iliyopita ni mara ngapi umekuwa na matatizo katika kinywa chako au meno (kwa mfano kama yaliyotajwa hapo juu au mengine) yaliyokusababishia taabu wakati wa **kula na kufaidi chakula?**

- a) sijawahi
- b) mara moja au mara mbili kwa mwezi
- c) mara moja au mara mbili kwa wiki
- d) kila siku

9.Ni matatizo gani hasa ya kinywa yaliyokusababishia taabu wakati wa **kula na kufaidi chakula?**

Hali	Ndiyo	Hapana
Maumivu ya jino		
Meno kufa ganzi		
Kung'oka kwa meno ya utoto		
Matatizo ya namna meno yalivyokaa		
Kidonda kwenye mdomo		
Kutoka damu kwenye mdomo		
Fizi kuvimba		
Harufu mbaya mdomoni		
Matatizo ya rangi ya meno yako		
Matatizo ya nafasi katika meno yako		

10. Katika miezi mitatu iliyopita ni mara ngapi umekuwa na matatizo katika kinywa chako au meno yaliyokusababishia taabu wakati wa **kuzungumza na kutamka kwa uwazi?**

- a) sijawahi
- b) mara moja au mara mbili kwa mwezi
- c) mara moja au mara mbili kwa wiki
- d) kila siku

11. Ni matatizo gani hasa ya kinywa yaliyokusababishia taabu wakati wa **kuzungumza na kutamka kwa uwazi?**

Hali	Ndiyo	Hapana
Maumivu ya jino		
Meno kufa ganzi		
Kung'oka kwa meno ya utoto		
Matatizo ya namna meno yalivyokaa		
Kidonda kwenye mdomo		
Kutoka damu kwenye mdomo		
Fizi kuvimba		
Harufu mbaya mdomoni		
Matatizo ya rangi ya meno yako		
Matatizo ya nafasi katika meno yako		

12. Katika miezi mitatu iliyopita ni mara ngapi umekuwa na matatizo katika kinywa chako au meno yaliyokusababishia taabu wakati wa **kuyasafisha meno yako?**

- a) sijawahi
- b) mara moja au mara mbili kwa mwezi
- c) mara moja au mara mbili kwa wiki
- d) kila siku

13. Ni matatizo gani hasa ya kinywa yaliyokusababishia taabu wakati wa **kuyasafisha meno yako?**

Hali	Ndiyo	Hapana
Maumivu ya jino		
Meno kufa ganzi		
Kung'oka kwa meno ya utoto		
Matatizo ya namna meno yalivyokaa		
Kidonda kwenye mdomo		
Kutoka damu kwenye mdomo		
Fizi kuvimba		
Harufu mbaya mdomoni		
Matatizo ya rangi ya meno yako		
Matatizo ya nafasi katika meno yako		

14. Katika miezi mitatu iliyopita ni mara ngapi umekuwa na matatizo katika kinywa chako au meno yaliyokusababishia taabu wakati wa **kulala na kupumzika?**

- a) sijawahi
- b) mara moja au mara mbili kwa mwezi
- c) mara moja au mara mbili kwa wiki
- d) kila siku

15. Ni matatizo gani hasa ya kinywa yaliyokusababishia taabu wakati wa **kulala na kupumzika?**

Hali	Ndiyo	Hapana
Maumivu ya jino		
Meno kufa ganzi		
Kung'oka kwa meno ya utoto		
Matatizo ya namna meno yalivyokaa		
Kidonda kwenye mdomo		
Kutoka damu kwenye mdomo		
Fizi kuvimba		
Harufu mbaya mdomoni		
Matatizo ya rangi ya meno yako		
Matatizo ya nafasi katika meno yako		

16. Katika miezi mitatu iliyopita ni mara ngapi umekuwa na matatizo katika kinywa chako au meno yaliyokusababishia taabu wakati wa **kutabasamu, kucheka, na kuonyesha meno bila kuona aibu?**

- a) sijawahi
- b) mara moja au mara mbili kwa mwezi
- c) mara moja au mara mbili kwa wiki
- d) kila siku

17. Ni matatizo gani hasa ya kinywa yaliyokusababishia taabu **wakati wa kutabasamu, kucheka na kuonyesha meno bila kuona aibu?**

Hali	Ndiyo	Hapana
Maumivu ya jino		
Meno kufa ganzi		
Kung'oka kwa meno ya utoto		
Matatizo ya namna meno yalivyokaa		
Kidonda kwenye mdomo		
Kutoka damu kwenye mdomo		
Fizi kuvimba		
Harufu mbaya mdomoni		
Matatizo ya rangi ya meno yako		
Matatizo ya nafasi katika meno yako		

18. Katika miezi mitatu iliyopita ni mara ngapi umekuwa na matatizo katika kinywa chako au meno yaliyokusababishia taabu katika **kuendelea kuwa na hali ya kawaida ya mhemko bila ya kukereka?**

- a) sijawahi
- b) mara moja au mara mbili kwa mwezi
- c) mara moja au mara mbili kwa wiki
- d) kila siku

19 Ni matatizo gani hasa ya kinywa yaliyokusababishia taabu katika **kuendelea kuwa na hali ya kawaida ya mhemko bila ya kukereka?**

Hali	Ndiyo	Hapana
Maumivu ya jino		
Meno kufa ganzi		
Kung'oka kwa meno ya utoto		
Matatizo ya namna meno yalivyokaa		
Kidonda kwenye mdomo		
Kutoka damu kwenye mdomo		
Fizi kuvimba		
Harufu mbaya mdomoni		
Matatizo ya rangi ya meno yako		
Matatizo ya nafasi katika meno yako		

20. Katika miezi mitatu iliyopita ni mara ngapi umekuwa na matatizo katika kinywa chako au meno yaliyokusababishia taabu katika **kufanya kazi kubwa za shule au kutekeleza majukumu ya kijamii?**

- a) sijawahi
- b) mara moja au mara mbili kwa mwezi
- c) mara moja au mara mbili kwa wiki
- d) kila siku

21. Ni matatizo gani hasa ya kinywa yaliyokusababishia taabu katika **kufanya kazi kubwa za shule au kutekeleza majukumu ya kijamii?**

Hali	Ndiyo	Hapana
Maumivu ya jino		
Meno kufa ganzi		
Kung'oka kwa meno ya utoto		
Matatizo ya namna meno yalivyokaa		
Kidonda kwenye mdomo		
Kutoka damu kwenye mdomo		
Fizi kuvimba		
Harufu mbaya mdomoni		
Matatizo ya rangi ya meno yako		
Matatizo ya nafasi katika meno yako		

22. Katika miezi mitatu iliyopita ni mara ngapi umekuwa na matatizo katika kinywa chako au meno yaliyokusababishia taabu katika **kufurahia na kukutana na watu?**

- a) sijawahi
- b) mara moja au mara mbili kwa mwezi
- c) mara moja au mara mbili kwa wiki
- d) kila siku

23. Ni matatizo gani hasa ya kinywa yaliyokusababishia taabu katika **kufurahia na kukutana na watu?**

Hali	Ndiyo	Hapana
Maumivu ya jino		
Meno kufa ganzi		
Kung'oka kwa meno ya utoto		
Matatizo ya namna meno yalivyokaa		
Kidonda kwenye mdomo		
Kutoka damu kwenye mdomo		
Fizi kuvimba		
Harufu mbaya mdomoni		
Matatizo ya rangi ya meno yako		
Matatizo ya nafasi katika meno yako		

24. FOMU YA KUCHUNGUZA MENO YALIYOOZA

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Key: 0=halijaoza, 1=limeoza, 2=limezibwa lakini pia limeoza, 3=limezibwa na halijaoza, 4=limeng'olewa kwa sababu ya kuoza, 5= Halijaota

